

Core Ideas, Topics and Titles	Established Goals	Understandings of Concepts	Essential Questions	Students will be able to: (Outcomes)
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**GRADE FIVE**

<p><b>Core Idea: Mechanical Waves, PS4A</b></p> <p><b>Topic: Waves and Their Properties</b></p> <p><b>Title: <i>Waves Around Us</i></b></p>	<ul style="list-style-type: none"> <li>• Waves are patterns of motion or electromagnetic disturbances that transfer energy from place to place without overall displacement of matter.</li> <li>• Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).</li> </ul>	<ul style="list-style-type: none"> <li>• Waves are all around us</li> <li>• Our daily lives are dependent on waves.</li> <li>• Waves can differ in amplitude (height of wave) and wavelength (spacing between wave peaks).</li> </ul>	<ul style="list-style-type: none"> <li>• What are waves?</li> <li>• What are some types of waves?</li> <li>• How are waves useful in our lives?</li> </ul>	<ul style="list-style-type: none"> <li>• Explain what causes mechanical waves.</li> <li>• Explain two types of waves and how they can be represented.</li> <li>• Explain, define and demonstrate transverse waves, longitudinal waves, wavelength and amplitude.</li> </ul>
<p><b>Core Idea: Mechanical Waves, PS4A</b></p> <p><b>Topic: Wave Interference</b></p> <p><b>Title: <i>Waves Meet Waves</i></b></p>	<ul style="list-style-type: none"> <li>• Waves are patterns of motion or electromagnetic disturbances that transfer energy from place to place without overall displacement of matter.</li> <li>• Waves can add or cancel one another as they cross, depending on their relative phase (i.e. relative position of peaks and troughs of the waves), but they emerge unaffected by each other.</li> </ul>	<ul style="list-style-type: none"> <li>• Waves can add or cancel one another as they cross by they emerge unaffected by each other.</li> </ul>	<ul style="list-style-type: none"> <li>• What are the different types of wave interferences?</li> <li>• How does wave interference affect waves?</li> </ul>	<ul style="list-style-type: none"> <li>• Define interference between waves.</li> <li>• Distinguish between the two types of interference, constructive and destructive.</li> </ul>

<p><b>Core Idea: Electromagnetic Radiation, PS4B</b></p> <p><b>Topic: EM Spectrum</b></p> <p><b>Title: <i>What is the Electromagnetic Spectrum?</i></b></p>	<ul style="list-style-type: none"> <li>• Electromagnetic waves can be detected over a wide range of frequencies.</li> <li>• Understanding of waves and their interactions with matter has been used to design technologies and instruments that greatly extend the range of phenomena that can be investigated by science (e.g. telescopes, microscopes) and have many useful applications in the modern world.</li> <li>• Electromagnetic radiation (e.g. radio, microwaves, light) can be modeled as a wave pattern of changing electric and magnetic fields</li> </ul>	<ul style="list-style-type: none"> <li>• The entire range of electromagnetic waves with different frequencies and wavelengths is called the electromagnetic spectrum.</li> <li>• Each type of electromagnetic wave has a different frequency and wavelength.</li> <li>• Each type of electromagnetic wave carries a different amount of energy.</li> </ul>	<ul style="list-style-type: none"> <li>• What is the electromagnetic spectrum?</li> <li>• What is an electromagnetic wave?</li> <li>• What waves make up the electromagnetic spectrum?</li> <li>• How are electromagnetic waves useful in our lives?</li> </ul>	<ul style="list-style-type: none"> <li>• Explain how electromagnetic waves are alike and how they differ.</li> <li>• Describe the waves that make up the electromagnetic spectrum.</li> <li>• Be able to label the parts of an electromagnetic spectrum.</li> </ul>
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<p><b>Core Idea: Electromagnetic Radiation, PS4B</b></p> <p><b>Topic: Understanding the electromagnetic Spectrum</b></p> <p><b>Title: Stations: Electromagnetic Spectrum Stations</b></p>	<ul style="list-style-type: none"> <li>• Electromagnetic radiation (e.g. radio, microwaves, light) can be modeled as a wave pattern of changing electric and magnetic fields.</li> <li>• Electromagnetic waves can be detected over a wide range of frequencies, of which the visible spectrum of colors detectable by the human eye, is just a small part.</li> <li>• Many modern technologies are based on the manipulation of electromagnetic waves.</li> </ul>	<ul style="list-style-type: none"> <li>• Visible light is the only electromagnetic waves we can see. It can be separated into rainbow colors.</li> <li>• Radio waves can be artificially generated to be used for communication.</li> <li>• Radar works by sending out bursts of microwaves, and then detecting the “echoes” coming back from the objects they it. This is used to detect an object, find the speed of an object or to map something.</li> <li>• Many modern technologies use infrared radiation such as remotes.</li> <li>• Ultraviolet light is found in sunlight. It can cause chemical reactions that can cause certain substances to glow or fluoresce. It can damage our skin.</li> <li>• X-rays show shadows left by things that the X-rays can’t travel through, such as bones or metal.</li> </ul>	<ul style="list-style-type: none"> <li>• What are the different types of electromagnetic waves?</li> <li>• How are they used in our daily lives?</li> <li>• What are the modern technologies that use infrared radiation?</li> <li>• What are the properties of ultraviolet light?</li> <li>• How can radio waves be artificially generated for communication systems?</li> <li>• What kind of rays does radioactive material emit?</li> </ul>	<ul style="list-style-type: none"> <li>• Make a simple radio and send Morse code messages.</li> <li>• Demonstrate an understanding of microwaves by using a radar gun.</li> <li>• Use the engineering design process to investigate infrared remotes.</li> <li>• Explain that visible light is the presence of all colors and the only electromagnetic radiation we can see.</li> <li>• Demonstrate the importance of sunscreen in protecting our skin from ultraviolet light.</li> <li>• Understand that X-rays and gamma rays are useful in our lives.</li> </ul>
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<p><b>Core Idea: Engineering Design, ETS.1</b></p> <p><b>Theme: Engineering Design Process</b></p> <p><b>Lesson Topic:</b> <i>Go Fly A Kite</i></p>	<ul style="list-style-type: none"> <li>• The design process, the engineer’s basic approach to problem-solving, involves many different practices. They include: problem definition, model development and use, investigating, analysis and interpretation of data, application of mathematics and computational thinking and determination of solutions.</li> </ul>	<ul style="list-style-type: none"> <li>• Marconi designed a kite to raise his antenna to send his wireless message.</li> <li>• Wind speed affects kite flight.</li> <li>• The design of a kite will affect the length of wire it can carry.</li> </ul>	<ul style="list-style-type: none"> <li>• Which kite design can hold the longest copper wire “antenna” while flying as high as possible?</li> </ul>	<ul style="list-style-type: none"> <li>• Design a kite that will be able to raise the longest 18 gauge copper wire antenna as high as possible.</li> </ul>
<p><b>Core Idea: Information Technologies and Instrumentation, ETS2.B</b></p> <p><b>Topic: History of Wireless Communication</b></p> <p><b>Title: <i>Who was Guglielmo Marconi?</i></b></p>	<ul style="list-style-type: none"> <li>• Engineers improve existing technologies or develop new ones to increase their benefits.</li> <li>• When new technologies become available, they can bring about changes in the way people live and interact with one another.</li> </ul>	<ul style="list-style-type: none"> <li>• Guglielmo Marconi searched and developed a solution to trans-Atlantic wireless communication.</li> <li>• History of wireless from Marconi’s invention for Ship-to-Shore Radio application to present day application.</li> </ul>	<ul style="list-style-type: none"> <li>• Who was Guglielmo Marconi and why is he influential to wireless communication today?</li> </ul>	<ul style="list-style-type: none"> <li>• Develop a timeline or some visual display that illustrates the beginning of wireless communication established by Guglielmo Marconi to the present-day state of wireless.</li> <li>• In what ways did people’s lives change after the introduction of wireless communications in ship to shore communications?</li> </ul>